ABSTRACT

A BIOMECHANICAL APPROACH TO QUANTIFY LODGING IN SWEET SORGHUM FOR BIOFUELS

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Sweet *sorghum* (*Sorghum bicolor L. Moench*) is an important bioenergy feedstock for biofuels. Characteristics of sweet sorghum cultivars are typically tall, high biomass types with juicy stalks, and high sugar concentrations, making it an excellent source for biofuel. However, due to their increased height, tall sorghums are susceptible to stem lodging, defined as mechanical failure of the main stem due to bending from external forces. Lodging reduces yield, and current methods to measure lodging resistance for tall sweet sorghums are unreliable due to the infrequent nature of lodging. Biomechanics offers a superb tool for sorghum breeders as a reliable methodology to effectively screen traits and relate those phenotypic attributes to the susceptibility of lodging. The goal of this study is to develop a three-point bend test (3PBT) to measure *sorghums* biomechanical properties (BP) (i.e. strength, stress, elasticity) and stem geometry as a method to efficiently and accurately quantify lodging in sweet sorghum. Phenotypic data and BP was collected for 16 genotypes grown in 2013-2014 in Weslaco and College Station, Texas. Preliminary results demonstrate that applying a 3PBT was able to identify the weakest region of a sorghum stalk and detect significant differences among genotypes ($P<0.0001$). Results from this study demonstrate that this method is efficient, repeatable, and allows breeders to test plants fresh from the field as well as rank genotypes accordingly in order to select for lodging resistant cultivars, increase yield and meet biofuel demands.

Keywords: sweet sorghum, lodging, biomechanics.